

Angus Max Multi Fuel Boiler

Installation, Operation and Maintenance Manual



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Information on the boiler plate

The boiler Serial No. is shown on the plate which is attached to the cover panel of the cast iron body.


SOLID FUEL BOILER		S.MAX SERIES	
Boiler Class :1.....		
Boiler Type :		
Temperature Limit (min/max) (C) :30 - 90.....		
Pressure Limit (min/max) (bar) :0.4 - 4.....		
Fuel 1: Coal Heating Output Range (kW) :		
Fuel 2: Wood Heating Output Range (kW) :		
Water Content (L) :		
Test Pressure PT (bar) / Date :	5,2 /		
Serial Number :		
Production Year :		
Manufacturer :			
DN 50 FLUID GROUP 2			
 0036			
<ul style="list-style-type: none">- The boiler may only be installed in rooms which complies with the appropriate ventilation requirements.- Read the installation manual carefully before installing the boiler.- Read the installation manual carefully before operating the boiler.			

fig. 01

Boiler dimensions

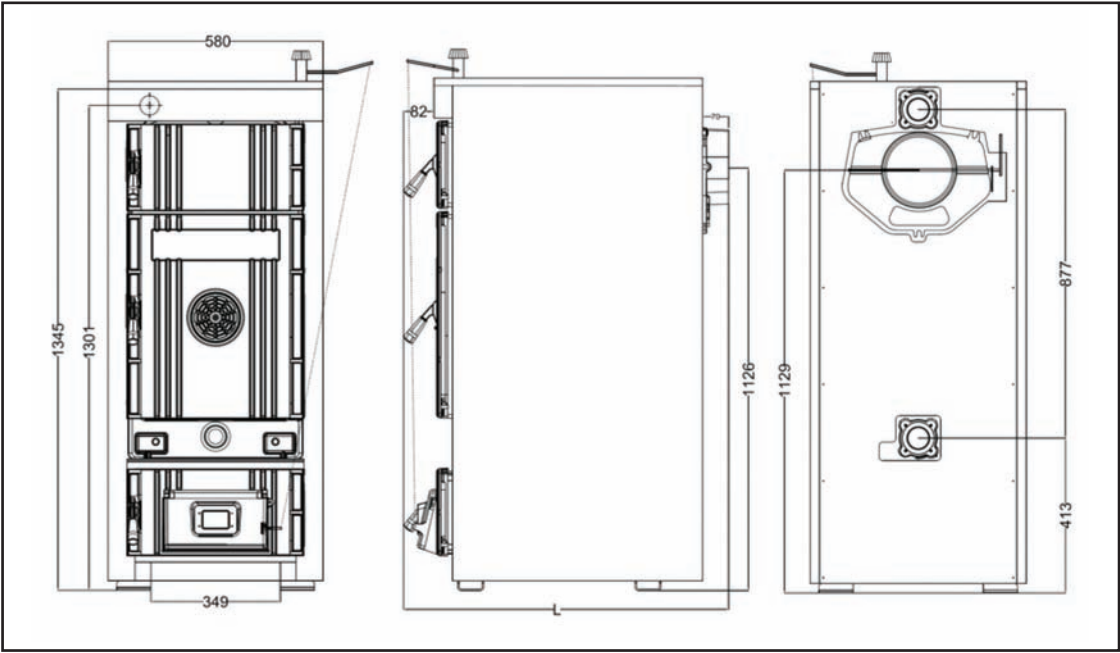


fig. 02

Series	Angus Max-04	Angus Max-05	Angus Max-06	Angus Max-07	Angus Max-08	Angus Max-09	Angus Max-10
L (mm)	673	773	873	973	1073	1173	1273

Boiler packaging dimensions

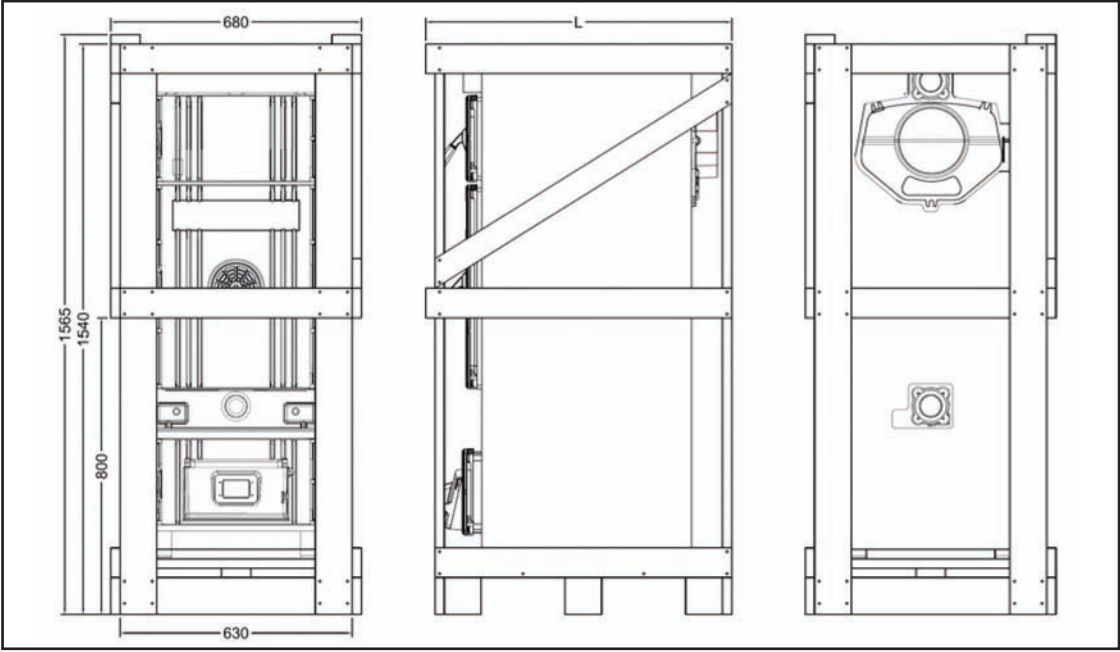


fig. 03

Series	Angus Max-04	Angus Max-05	Angus Max-06	Angus Max-07	Angus Max-08	Angus Max-09	Angus Max-10
L (mm)	730	830	930	1030	1130	1230	1330

Notice: Please obey to the meanings of the symbols on packaging for health care
 




Technical parameters

Boiler Type		Angus Max-04	Angus Max-05	Angus Max-06	Angus Max-07	Angus Max-08	Angus Max-09	Angus Max-10
Number of Elements	Pcs.	4	5	6	7	8	9	10
Nominal Heat Output (Black Coal – Walnut)	kW	35.0-38.0	44.0-48.0	54.0-58.0	63.0-67.5	73.6-77.0	83.5-86.0	91.0-95.0
Nominal Heat Output (Hardwood – Split Logs)	kW	29.0-33.0	36.0-40.5	43.0-47.0	50.8-54.5	56.0-61.0	64.0-68.0	72.4-75.0
Heating Water Maximum Temperature	°C	90						
Heating Return Water Minimum Temperature	°C	50						
Safety Valve Temperature Limit	°C	95						
Burning Time For Nominal Output (B Coal)	h	>4						
Burning Time For Nominal Output (H Coal)	h	>2						
Maximum Pressure of System	bar	4						
Minimum Pressure of System	bar	0.4						
Boiler Water Content W x H L	lit.	28.9	34.6	40.3	46.0	51.7	57.4	63.1
	m³	0.0289	0.0346	0.0403	0.0460	0.0517	0.0574	0.0631
Minimum Chimney Depression	mbar	0.14	0.18	0.22	0.26	0.30	0.34	0.38
Exit Flue Connection Diameter	mm	150	150	180	180	180	200	200
Combustion Chamber Dimensions (W x H)	mm	390 x 654						
	mm	335	435	535	635	735	835	935
Exit Flue Gas Temperature	°C	220-280						
Water Inlet – Outlet Connection	(")	G2"						
Inlet – Outlet Connection Temperature Safety Valve	(")	G½"						
Boiler Drain	(")	G½"						
Maximim Noisiness acc. to Valid Norms	dB	60 (A)						
Weight	kg	336	387	438	4489	540	591	642

A table of the Angus Max Heating Area

SOLID FUEL BOILERS HEAT OUTPUT AND MAX HEATING AREA (M2)

FOR COAL			
MODEL	HEAT OUTPUT (kW)	HEAT OUTPUT (kCAL)	MAX HEATING AREA (UNC) (M2)
Angus Max – 04	38	32,672	327
Angus Max – 05	48	41,270	413
Angus Max – 06	58	49,868	498
Angus Max – 07	68	58,466	585
Angus Max – 08	77	66,205	662
Angus Max – 09	86	73,942	740
Angus Max – 10	95	81,691	817

FOR WOOD			
MODEL	HEAT OUTPUT (kW)	HEAT OUTPUT (kCAL)	MAX HEATING AREA (UNC) (M2)
Angus Max – 04	33	28,373	284
Angus Max – 05	41	35,219	353
Angus Max – 06	47	40,373	404
Angus Max – 07	55	47,245	473
Angus Max – 08	61	52,399	525
Angus Max – 09	68	58,412	585
Angus Max – 10	75	64,425	645

*** For cold climate and low insulation houses, Max Heating Area should be decreased approximately 10%

*** For mild climate and strong insulation houses, Max Heating Area should be increased approximately 10%

Introduction

1. The boiler and all associated equipment must be installed and used in accordance with the installation design, all applicable legal regulations and technical standards and with the manufacturer's instructions. The boiler may be used only for the purpose for which it is intended.
2. The boiler may be installed only in an environment which it is designed for. If the boiler is delivered to the client by the same person who installs it, he must give the user also all accompanying boiler documentation (in particular User Guide, Service Book, etc.). Until the boiler is put into service, the original packaging must be kept in case the boiler has to be transported again.
3. After installation, the boiler must be put into operation by a service organisation authorised by the manufacturer.
4. The boiler complies with regulations applicable in the European Union. When used in the conditions of countries outside at EU, any deviations from local regulations must be identified and rectified.
5. In the event of a defect, call an authorised manufacturer's service organisation – any unauthorised interference may damage the boiler (and possibly also associated equipment!).
6. The service technician putting the boiler into operation for the first time must show the user the various parts of the boiler and how to control the boiler, with the boiler safety elements, their signals and appropriate user reaction to them, with fundamental parts of the boiler and their controls. If the boiler is delivered to the client by the same person who installs it, he must make sure that the original packaging is available in case the boiler has to be transported again.
7. Check the delivery for completeness.
8. Check whether the model and type supplied is suitable for the required use.
9. Whenever you are not certain how to control the boiler, study appropriate instructions in this Operation and Installation Guide carefully and proceed accordingly.
10. Never remove or damage any markings and signs on the boiler. Keep the original packaging until the boiler has been put into service, in case the boiler has to be transported again.
11. When making any repairs, only original parts must always be used. It is forbidden to make any changes to the boiler's internal installation, or to interfere with it in any way.
12. At the end of its life cycle, the boiler its package and its parts must be disposed of in a way avoiding harm to the environment.
13. The manufacturer disclaims any responsibility for damages caused by the failure to abide by:
 - The conditions stipulated in this Operation and Installation Guide
 - Applicable regulations and standards;
 - Sound installation and operation procedures; and
 - Conditions stated in the Warranty Certificate and the Service Book.

Situations might occur in practice, when the following essential precautions must be taken:

- Shut the boiler down every time when there are any (even temporary) flammable or explosive fumes present on the premises from which combustion air is supplied to the boiler (e.g. from paint when painting, laying and spraying molten substances, from gas leakage, etc.);
- If it is necessary to drain water from the boiler or from the whole system, the water must not be dangerously hot; and
- If there is any leakage from the boiler's heat exchanger, or when the exchanger is clogged up with ice, do not attempt to start up the boiler until normal operating conditions have been restored.

Ensuring safety of equipment and people

- The boiler (and all accessories) complies with the requirements of EN 303-5 its updates and all relevant European standards.
- In order to run and operate the boiler in accordance with the purpose for which it is designed in actual conditions of use (hereafter referred to only as use), it is necessary to abide also by additional requirements the most essential ones of which (i.e. those which must not be omitted) are found in the related regulatory documents.
- In addition to the above mentioned documents, it is necessary when using the boiler to proceed in accordance with this Operation and Installation guide and the accompanying boiler manufacturer's documentation.
- Any interference by children, persons under the influence of narcotic drugs, certified persons, etc., when using the boiler, must be prevented.

Head losses

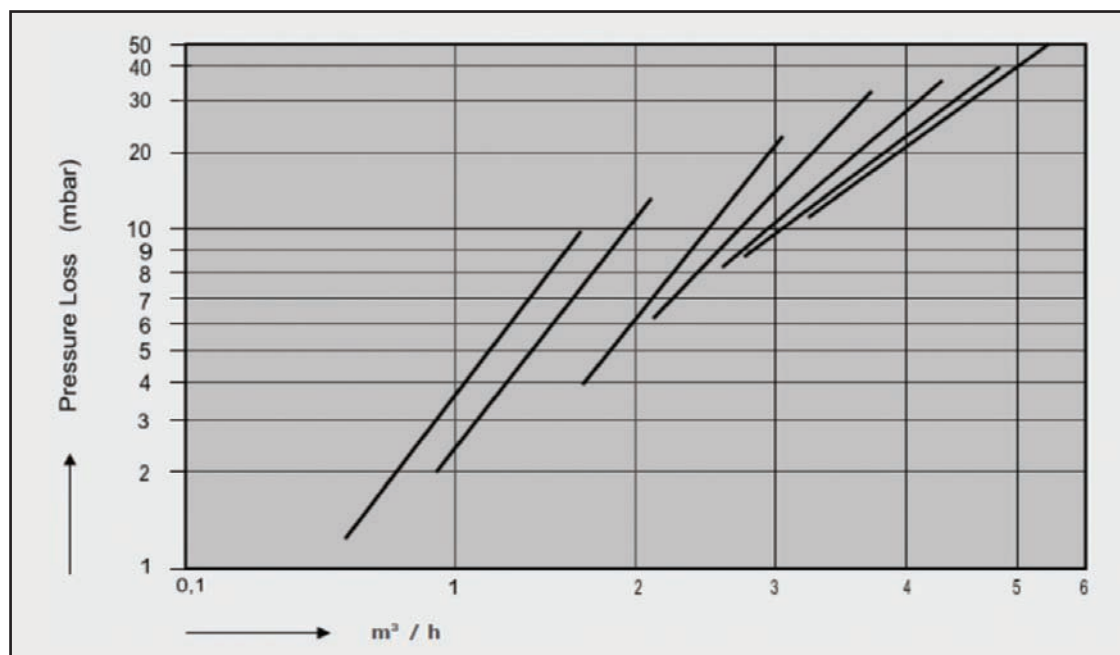


fig. 04

Operating instructions

Angus Max Series Boiler – General features

- Angus Max series solid fuel fired boiler is designed for heating both residential and industrial buildings.
- Besides professional installation, precondition for correct functioning of the boiler is the required chimney thrust and correct operation.
- Angus Max series solid fuel fired boiler is designed for heating systems which are suitable for forced circulation systems only.
- Angus Max series boilers are available in seven output series (determined by the number of segments 4, 5, 6, 7, 8, 9, 10) from 38 to 95 kW.
- The cast iron boiler body comprises of segments and serves as a combustion chamber (including combustion gases routes), and at the same time as a water reservoir (including water routes). Segments are of three types – front and rear, inserted between which are 1 to 8 middle segments (of the same kind). By assembling and joining together an appropriate number of segments, a boiler body of the required size is constructed (both the combustion chamber and the water reservoir). Assembled boiler body is equipped with necessary pipe sections for water connection. It also has brackets for fitting thermostat sensors and brackets on feet for fastening the boiler to the base. Attached to the cast iron boiler body are sheet metal covers which are fitted on the inside with thermal insulation.
- To ensure that the boiler functions correctly and runs economically, it is important that its nominal output is equal to the thermal losses of the heated premises.
- Choosing a boiler of insufficient output will result in inadequate heating of the premises, and thus failure to provide a heating comfort.
- Choosing a boiler of unnecessarily high output will result in the boiler not running in full output, and as a consequence in tarring and dewing.

Recommended fuel

- Recommended fuels for Angus Max boilers are coal, coke and firewood.
- Optimal coal and coke granularity is 24-60 mm.
- Optimal firewood size is logs of diameter 40-100 mm. Their length will depend on how many segments the boiler have.
- Fuel must be stored in a dry place. To reach the boiler nominal output, water content in firewood must not exceed 20%.
- Approximate stoking intervals (referred to as Burning Time) are shown in the Technical Data Table on page 3.
- The boiler is stoked manually.

Please note

The boiler is not intended for burning any type of waste.

Control and safety devices

Angus Max boilers are equipped with three main control elements: A **chimney flap (Fig. 05)**, by means of which the chimney thrust can be controlled, i.e. the discharge of combustion fumes into the chimney. The flap is situated in the flue neck of the boiler, and is controlled manually.

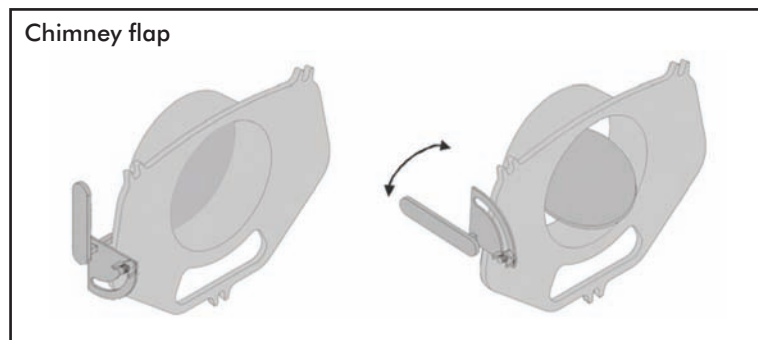


fig. 05

Another thrust control element is a **thermo-mechanical output regulator (Fig. 06)**. It is situated on the outlet from the boiler cast iron body. It detects temperature of the hot water and regulates the supply of primary combustion air to underneath the boiler stoker, by opening or shutting a flap situated in the ashtray door.

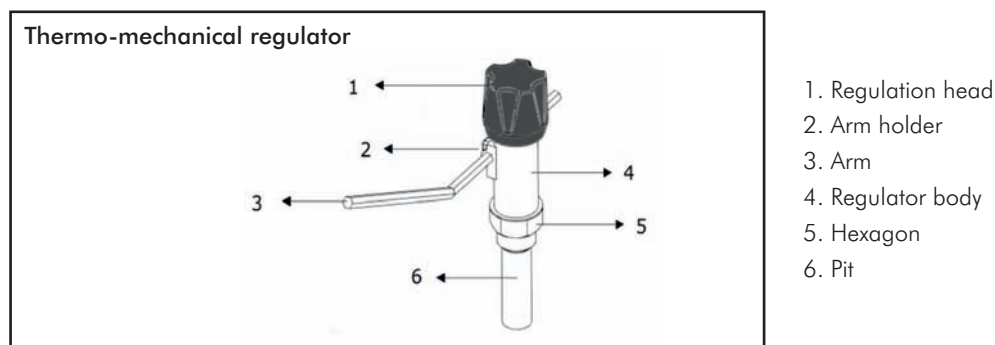


fig. 06



- When fitting the safety and the control elements remember to meet the principles of work safety.
- If replacing of safety device and of thermo-mechanical output regulator is necessary, please use recommended devices in case of using any other type of the device negotiate with Eco Angus Ltd.
- Functionality of thermo-mechanical output regulator (satrom) must be checked or inspected by authorised person once in a year.

Changing the hatch position controls the combustion intensity and thus the boiler output. The thermo mechanical output regulator is connected with the regulating hatch by chain. The chain is connected to the hatch in such a way that its tension can be set (**Fig. 07**).

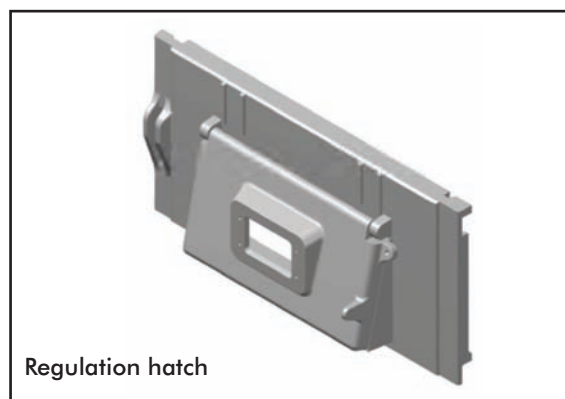


fig. 07



Keep object's away from regulation hatch's front and channels for allowing primary air transfer.

Supply of secondary combustion air is controlled by an air rosette (**Fig. 08**), situated in the boiler's stoking door, which has a direct effect on the level of emission.

Hot water temperature can be checked on a thermometer (**Fig. 09**), which is situated in the front boiler cover above the stoking door.

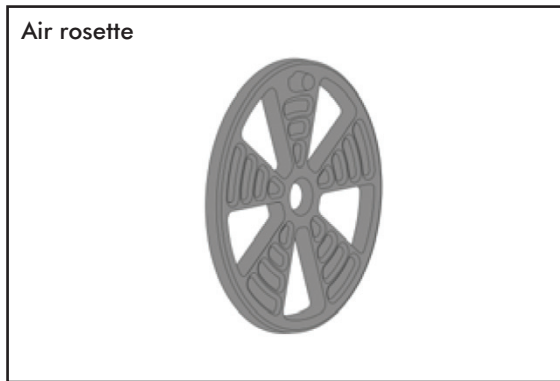


fig. 08



fig. 09

Temperature safety valve

The Angus Max boilers can be equipped with a safety heat exchanger with thermal safety valve as an optional which ensures dissipation of excessive heat without additional device and supply of external energy in such a way that the maximum permissible boiler temperature of 95°C is not exceeded.

For more information on the safety heat exchanger with thermal safety valve please see http://www.ecoangus.co.uk/ecoangus_images/Test_Reports_and_Instruction%20Manuals/1958_Safety_Heat_Exchanger_Manual_FINAL.pdf

Hydraulic connection diagram

It is suggested that open type hydraulic system should be installed according to following schemes.

Open expansion tank system

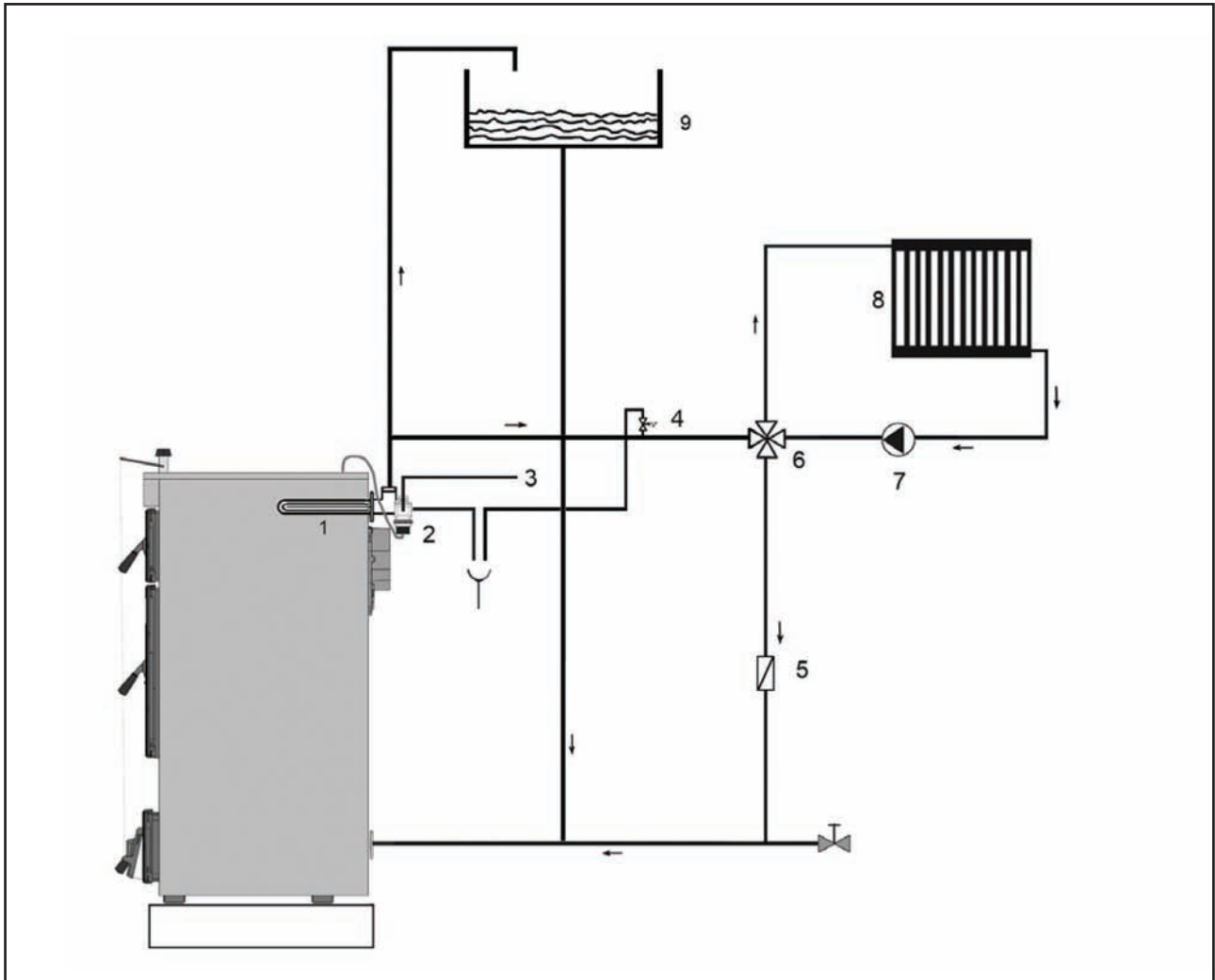


fig. 10

- | | |
|---------------------------------------|--------------------------|
| 1. Safety Heat Exchanger (SHT) | 6. Four Way Mixing Valve |
| 2. Safety Valve (TS 131, STS 20) | 7. CH Pump |
| 3. Cold Water Feed | 8. Heating System |
| 4. System Safety Valve (3 bar – 1/2") | 9. Open Expansion Tank |
| 5. NRV | |

- Open-type expansion tank must be equipped with the highest level in the entire hydraulic system.
- The expansion tank must be selected properly against the changes in water volume resulting from heating and cooling.
- The expansion tanks and their connecting pipes must be protected against to freezing.
- Diameter of drainage pipe must be selected properly against to overflow into tank.

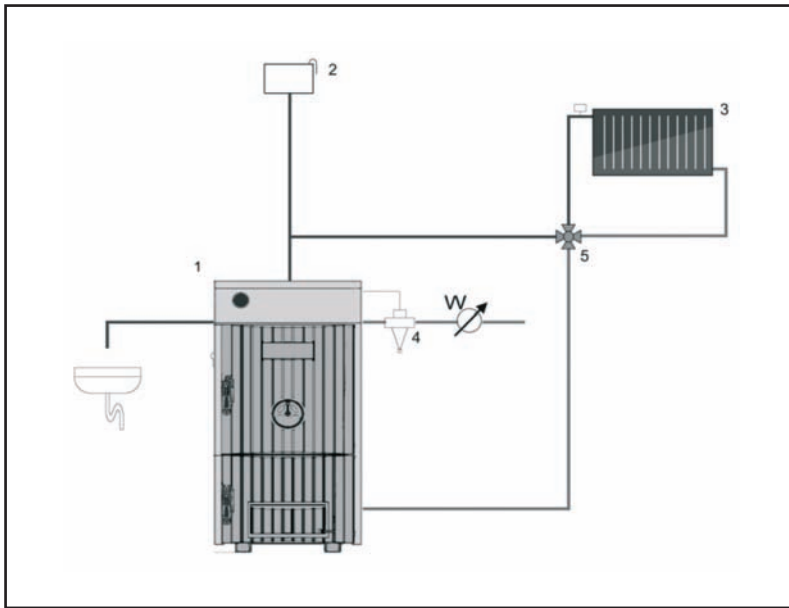


fig. 11

- | | |
|------------------------|----------------------------------|
| 1. Boiler | 4. Safety Valve (TS 131, STS 20) |
| 2. Open Expansion Tank | 5. Four Way Mixing Valve |
| 3. Radiator | |

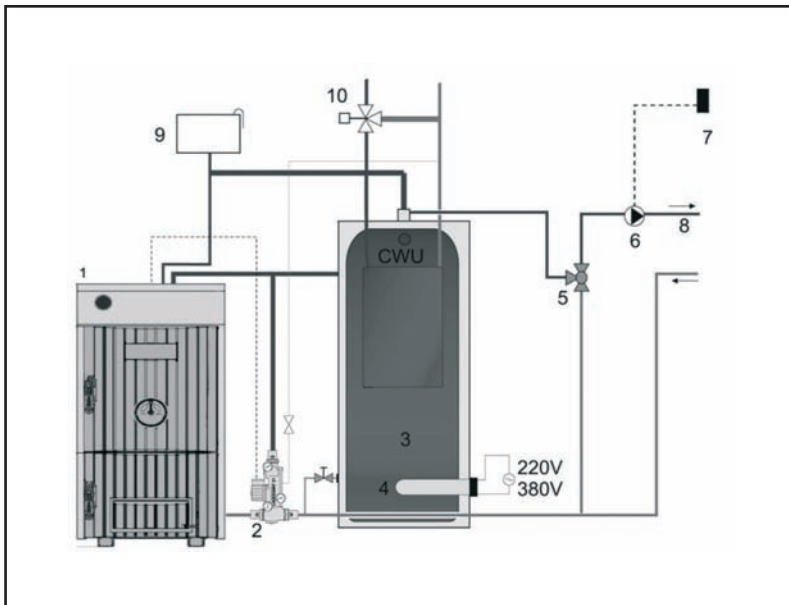


fig. 12

- | | |
|---|--------------------------|
| 1. Boiler | 6. Circulating Pump |
| 2. Laddomat 21-60 operated by Flue
Thermostat – 50-300°C | 7. Room Thermostat |
| 3. NAD or NADO Accumulator Tank | 8. Heating System Outlet |
| 4. Immersion Heater | 9. Open Expansion Tank |
| 5. Three Way Mixing Valve | 10. DHW Mixing Valve |

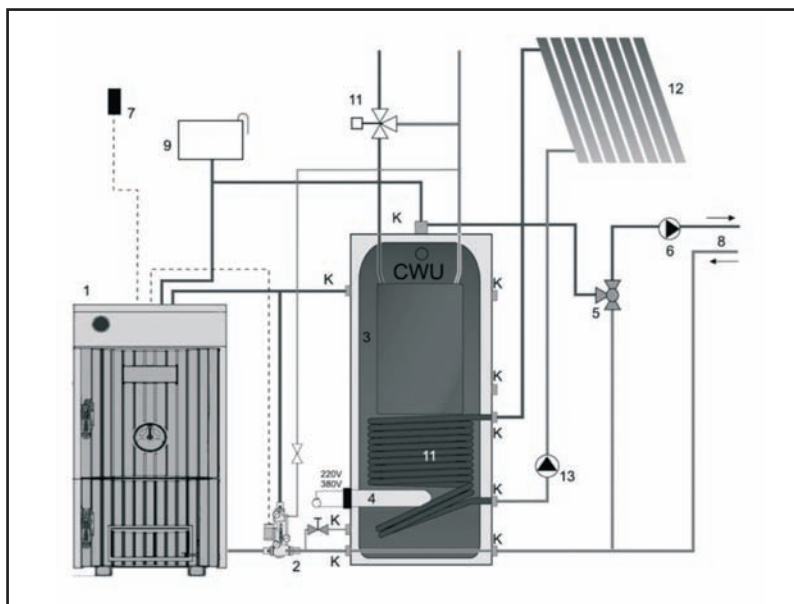


fig. 13

- | | | |
|---|---------------------------|----------------------------|
| 1. Boiler | 5. Three Way Mixing Valve | 10. DHW Mixing Valve |
| 2. Laddomat 21-60 operated by Flue
Thermostat – 50-300°C | 6. Circulating pump | 11. Solar Coil |
| 3. NAD or NADO Accumulator Tank | 7. Room Thermostat | 12. Solar |
| 4. Immersion Heater | 8. Heating System Outlet | 13. Solar Circulation Pump |
| | 9. Open Expansion Tank | |

Systems for Pressurised Tank

In a pressurized system consideration should be given for an appropriately sized expansion vessel on the central heating circuit before the return to the boiler and a safety group on the primary flow. It is essential to ensure that the expansion vessel is sized accordingly to your system. It is recommended to use an expansion vessel that is 15% of the volume of water in your system including the primary water in the accumulator tank if applicable. An appropriately rated pressure relief valve should also be used in the safety group. It is also recommended to use a safety heat exchanger with a thermal safety valve that we offer to ensure the boiler has overheat protection installed.

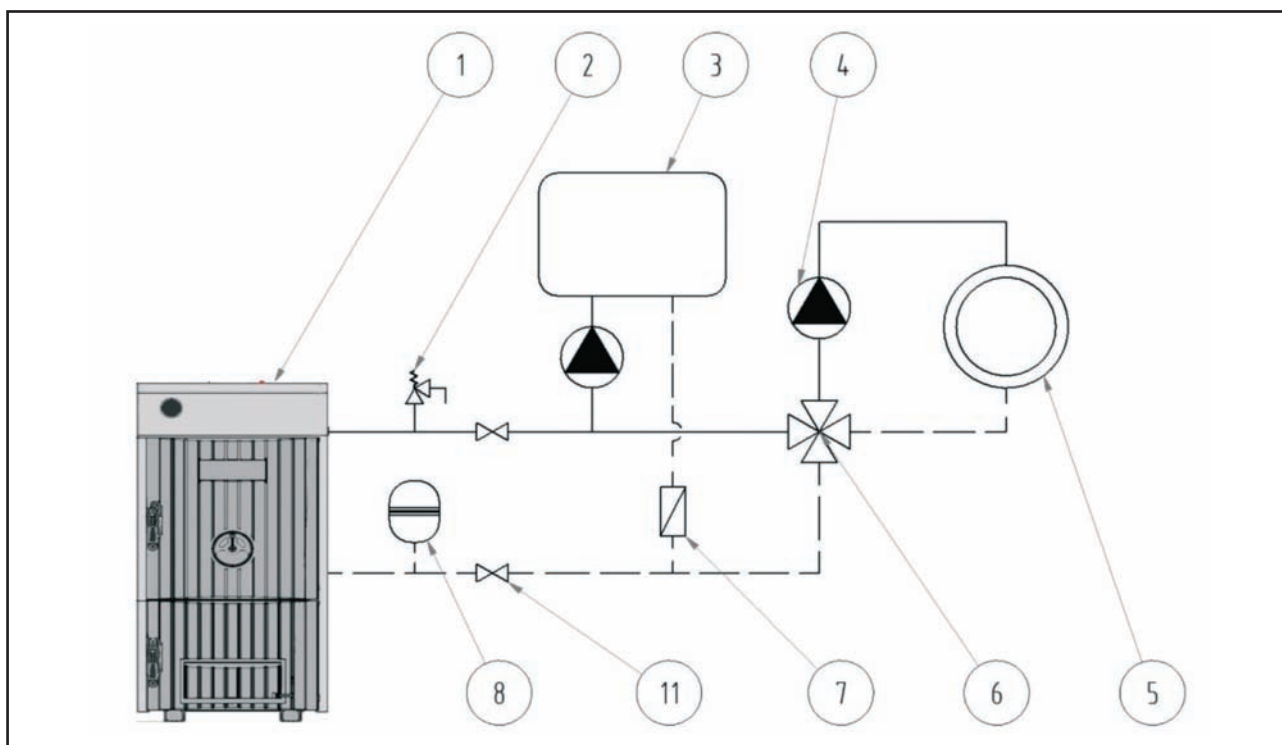


fig. 14

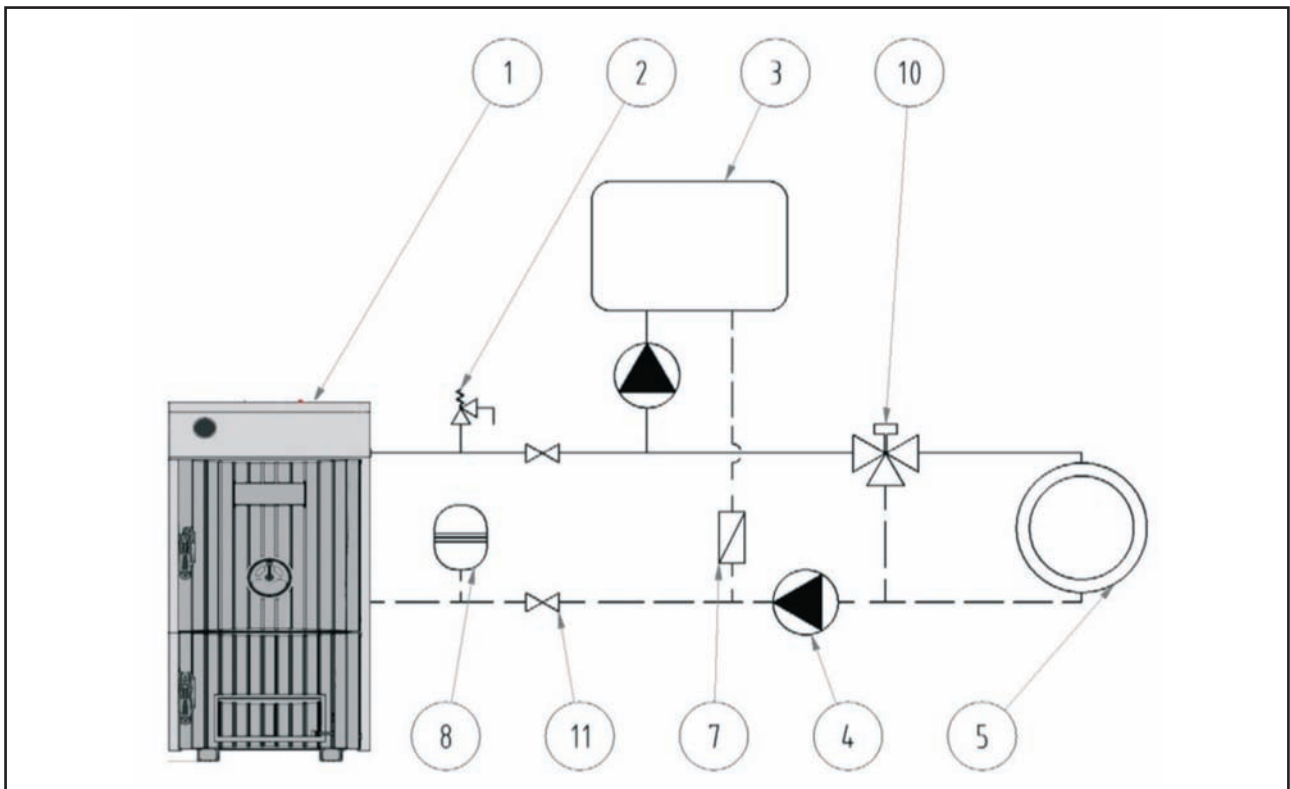


fig. 15

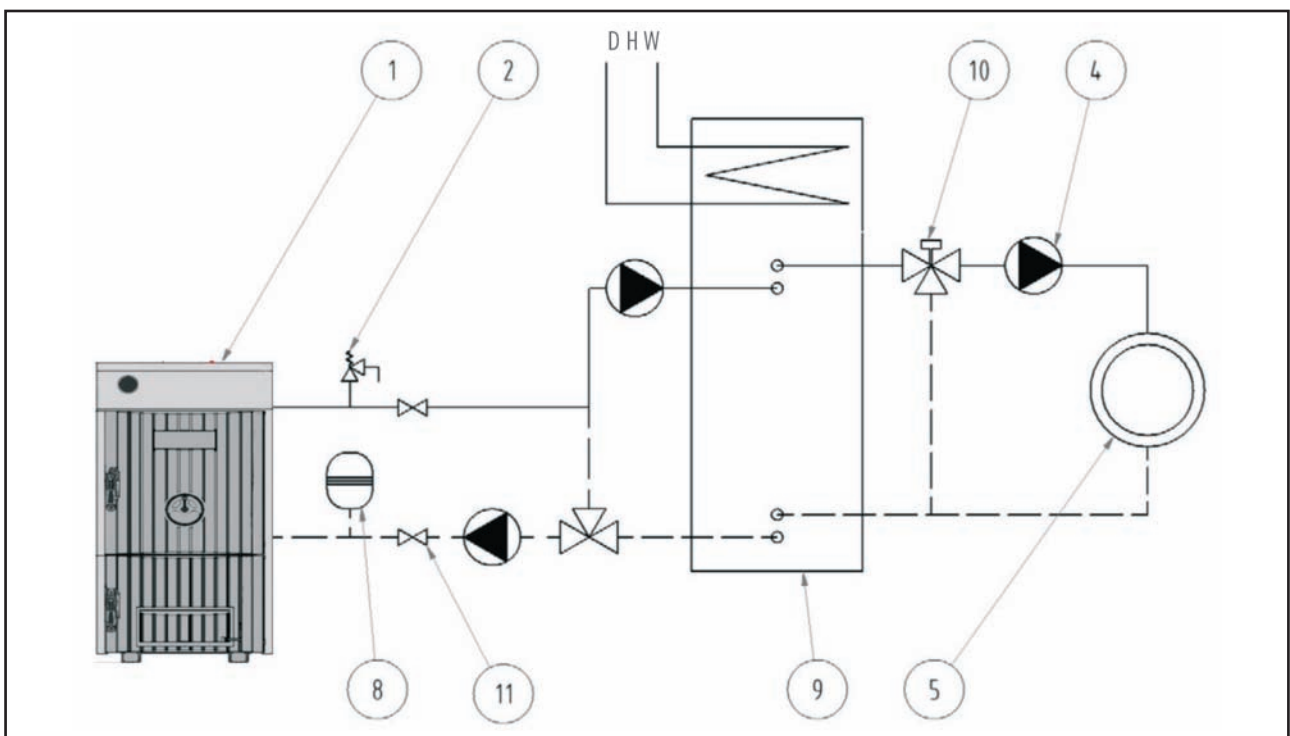


fig. 16

- | | |
|--|--------------------------|
| 1. Boiler | 6. Four Way Mixing Valve |
| 2. Safety Group (automatic air vent, pressure reducing valve and pressure gauge) | 7. NRV |
| 3. DHW Cylinder | 8. Expansion Vessel |
| 4. CH Pump | 9. Accumulator Tank |
| 5. Heating System | 10. Three Way Valve |
| | 11. Valve |

Putting the boiler into service

Checking the boiler before turning it on

Before putting the boiler into operation, the service technician must check:

- Whether the installation conforms with the design;
- Whether the boiler has been filled in and is under pressure, and whether there are any leakages in the heating system;
- Connection to the chimney – connection must be approved by an authorized chimney sweep (chimney inspection); and
- Functioning of the heating controls.

Please note

The service technician must show the user how to control the boiler and enter the date when the boiler was put into service into the Warranty Certificate.

Filling up and draining the heating system

The system can only be filled up or topped up with water which meets the parameters specified by EN standards. The water must be clear, colourless, free of suspended particles, oil and chemically corrosive substances, and must not be acidic (pH factor must be greater than 7.2). First of all, the heating system must be thoroughly flushed and all dirt washed out.

Please note

Water in the system must not be reduced or put out unless the boiler is in service or under freezing danger. Against freezing anti-freeze liquid can be added in to system water at the rate of 15%.

Please note

The failure to meet this requirement may lead to the heat exchanger getting clogged up, and the cast iron block may crack as a result. During the heating season, a constant volume of water must be maintained inside the heating system. When topping up water, care must be taken that no air is sucked into the system. Water must never be let out of the boiler or the heating system, unless it is absolutely essential, such as before repairs, etc. Draining water and refilling the system with new water increases the risk of corrosion and formation of incrustation.

Please note

Filling or topping up water to the heating system must always be done with the boiler cold or cooled down; otherwise the boiler segments may crack!

Operation and controls

Starting a fire

Check on the manometer whether there is enough water in the heating system. Open the shutting valve between the boiler and the heating system. Spread paper on top of the clean stoker and then enough finely chopped wood. Open the flue flap in the chimney adapter and shut the stoking door. Light the paper through the open ashtray door and fully open the regulating flap in the ashtray door. The fire has caught up enough, stoke a layer of main fuel on top of the burning firewood. When the fire is powerful enough, stoke more fuel right up to the bottom edge of the stoking door and level it in to provide an even layer throughout the entire boiler depth. If the fuel suddenly turns into dark red blaze, open partially the secondary air supply rosette in the stoking door. When the flame turns yellow, shut the secondary air supply rosette again. When the boiler has reached the required output, it is suitable to partially shut the flue thrust flap to prevent heat from unnecessarily escaping into the chimney.



- Do not start the boiler without connecting the boiler to the chimney.
- Control chimney connections before starting the boiler.
- Adjust the chimney blow as requested level. If chimney blow is under mentioned levels try not to use the boiler.

Setting the outlet water temperature

When the required outlet water temperature is say 60°C, heat up the boiler to a temperature for instance 5°C higher than the required temperature of 60°C (measured on the thermometer on the boiler outlet pipe). Then turn the control knob to 65°C and check whether the chain is stretched and the regulating hatch completely shut. This position of the chain and regulating hatch is fine-adjusted by turning the control knob. Then let the regulation process work. When the water temperature drops, the regulating hatch will start opening by the tension applied by the regulator on the chain. When the water temperature suddenly rises, the regulating hatch will start opening and the hot water temperature on the boiler outlet is controlled.

Stoking

First shut the regulating hatch; this will shut supply of combustion air into the boiler. Then open the chimney flap completely. Partially open the stoking door and wait until all combustion gases have been sucked from the combustion chamber into the chimney. Only then open the stoking door completely and start stoking the boiler. After shutting the stoking door, set the chimney flap again and restore the functioning of the regulating hatch.



- Boiler doors must not be held open as the boiler is continuously working.
- Provide a minimum 5cm gap to be between top point of the fuel and ceiling of stoking chamber when boiler is stoked.

Overnight heating mode

This mode is used when you want to maintain the fire in the boiler for instance over night. First scrape all ash out of the combustion chamber, with the chimney flap completely opened. Then stoke the boiler with fuel and shut the boiler up completely. Then shut the chimney flap and also almost shut the regulating hatch. This will reduce the chimney thrust and restrict the supply of combustion air. Shut also the secondary air supply rosette in the stoking door. To restore the boiler's required output, just open the chimney flap and partially open the regulating hatch to the required boiler output.

Removing solid combustion residuals

This is done by removing and emptying the ashtray situated underneath the stoker in the ash compartment. This must be done on a regular basis to prevent ash from accumulating and blocking the supply of air to the combustion chamber from underneath the stoker.

Dewing and tarring

When starting fire in a cold boiler, water condensates on the walls and runs down into the ash compartment, which may make an impression that the boiler is leaking. This dewing will disappear after the ashtray has settled on the boiler's inside walls. When running the boiler with low water temperature usually below 65°C, or when using damp fuel, water condensates in combustion gases and the condensate runs down the boiler's cold walls. Low temperature heating also reduces the chimney life. Therefore it is recommended to equip the boiler with for instance a four-way blending valve which will ensure that the temperature of return water does not drop below 50°C. Boiler tarring occurs under similar conditions (lack of combustion air, the boiler is choking). To prevent dewing and tarring, we recommend you run the boiler at temperatures higher than 65°C and choose a boiler to match the required heating system output. An oversized boiler suffers unnecessarily, because it has to be run at low temperatures.

Boiler shutdown

We do not recommend that you try to speed up the boiler combustion process. The fuel must burn completely on its own on the stoker.

Short term shutdown

After shutting the boiler down, clean it, remove all combustion residuals, empty the ashtray, clean the stoking door contact surfaces and the ash compartment, and then shut the boiler's stoking door and ash compartment door.

Long term shutdown

When shutting the boiler down for a protracted period of time (heating season end), the boiler must be thoroughly cleaned from all soot and ash sediments, in which dampness accumulates and causes excessive corrosion of the boiler body.

Important information

- The boiler may only be operated by an adult familiar with these Operating Instructions.
- Shut the boiler down every time there are any (even temporary) flammable or explosive fumes present on the premises from which combustion air is supplied to the boiler (e.g. From paint when painting, laying and spraying molten substances, from gas leakage, etc.).
- It is forbidden to light the boiler with explosive substances.
- It is forbidden to overheat the boiler.
- At the end of the heating season the boiler, flue and flue adapter, must be thoroughly cleaned. Lubricate all hinges, the flue flap mechanism and other moving.

Maintenance

Boilers maintenance are made in three programs. Daily (in everyday use), periodic and yearly.

Daily controls

These are the processes that the user must apply every day in season of everyday use. The combustion chamber and fittings must be checked. Combustion products in the chamber must be cleaned and the ash tank must be discharge.

Periodic controls:

For efficient use, preventing the possible failures and optimum life of the boiler periodic controls are important. It is recommended that periodical controls for the boiler must be made by once in every three months. These periodical controls are made by authorised technicians by applying following processes.

- Boilers combustion chamber and smoke channels check and cleaning if needed.
- Leakage controls of water input – water output of the boiler and flue connections.
- Valves check.
- Pumps check Burning control (with eye).
- Working and safety controls of hydraulic system and the boiler.

Yearly controls:

Yearly controls of the boiler must be made by authorised technicians before the season starts. Flue and flue lines must be cleaned before calling technicians for yearly controls. In yearly controls authorised technicians apply the following processes.

- Situation of the insulations and the sections and isolation rope controls.
- Working pressure test for burning adjustment with the flue gas measurement system if needed.
- Boiler burning room and possible soot layers on smoke channels are checks and cleanings.
- Leakproof of the connections of the boiler test.
- Valves test for proper opening and closing.
- Water filter test. Cleaning if needed.
- Expansion tank controls, cleaning if needed.
- Sensor of the pressure tests. Cleaning or renewing if needed.
- Working and safety controls of hydraulic system and the boiler.

Boiler cleaning

When the boiler is used, soot and fine ash accumulates on the boiler walls, mainly on heat exchanger ribs and in the flue neck, which reduces heat transfer and the boiler output. The actual quantity of soot and fine ash will depend on the quality of the fuel used and on the boiler operating conditions. If the boiler is oversized or was for some reason run at low temperatures, more soot is generated. This may also result in inadequate chimney thrust. The boiler must be cleaned regularly, at least once a month, which is done with a steel brush through an open boiler door.

All boiler walls inside the combustion chamber and combustion gases routes should be cleaned. If a larger quantity of tar has accumulated on internal walls of the combustion chamber, it must be removed with a scraper or burnt with hard wood (or coke), running the boiler at maximum operating temperature.

Please note

Ashes should be stored (by using proper glove) in a non-combustible container properly and transported outdoors. Other waste must not be stored in this container.

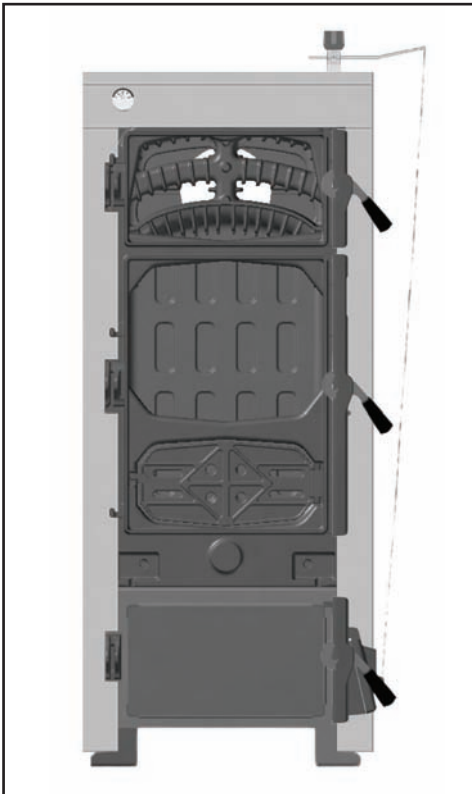


fig. 17

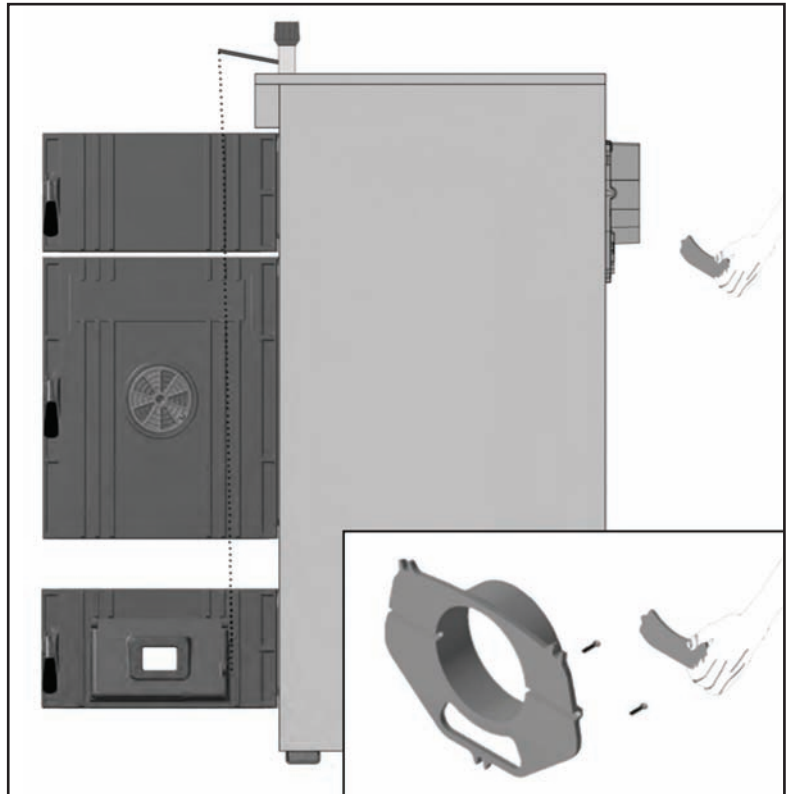


fig. 18

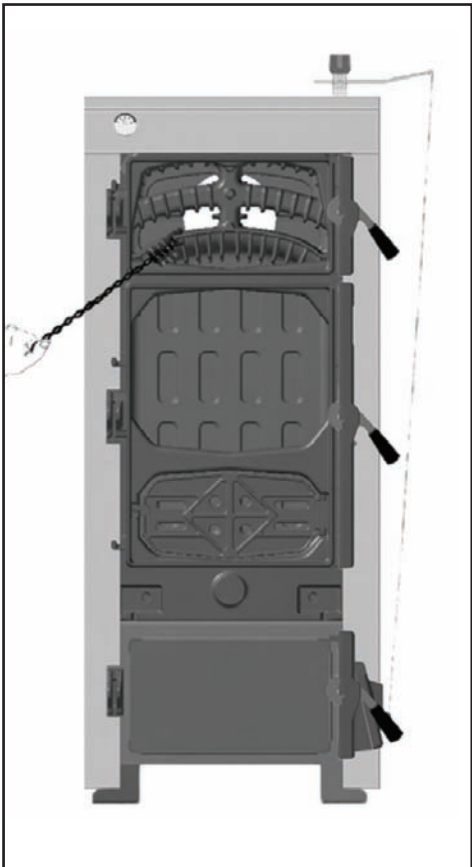


fig. 19



fig. 20

Boiler repairs

The boiler may be repaired by an authorised service technician or organisation only. The user or owner may do only normal maintenance and simple replacements of some parts – e.g. sealing cords.

Please note

When repairing the boiler, original parts must always be used.

Warranty and warranty conditions

Angus Max boilers are covered by warranty specified in the Warranty Certificate, Service Book and User and Installation Guide (chapter Introduction, Installing the boiler).

Boiler delivery

Angus Max boilers are supplied completely assembled and functionally tested.

The delivery includes:

1. Boiler
2. Operating and installation instructions
3. Service book
4. List of service centres
5. Warranty certificate
6. Thermo-mechanical output regulator
7. Cleaning kit (brush, mixing rod)

Installation Instructions

Boiler installation – general information

Angus Max boilers must be put into service by an authorized services. A network of authorised service organisations which meet these conditions is available for all boiler installations, putting them into service and for warranty repairs.

The boiler is designed to supply heating systems with gauge pressure up to 400 kPa which use water that meets the requirements of related standards (under no circumstances may the water be acidic, i.e. it must have $\text{pH} > 7$, and it should have minimum carbon hardness). The heating system must be designed in such a way that hot water can circulate all the time through at least some of the radiators. Antifreeze fluids – because of their unsuitable properties, we do not recommend to use them. They have a reduced ability to transfer heat, have large volumetric expansion, age and damage rubber components. If under concrete circumstances there is no other option how to reliably prevent.

Before final installation, the heating system distribution piping must be flushed several times with pressurised water. In old, already used systems, the flushing must be done in opposite direction to the hot water circulation. In new systems, all radiators must be cleaned from conservation material. and rinsed with warm water under pressure.

We recommend installing a sludge trap upstream of the boiler (i.e. on hot water return pipe). The sludge trap design should allow emptying in regular intervals, without the need to drain a lot of hotwater. The sludge trap may be combined with a filter; however, a filter alone will not provide an adequate protection.

Please note

System must be connected to open expansion tank for safety reasons.

Any valve must not be connected to safety input and safety output lines.

For increasing safety of the system, by-pass line must be installed on the line between input and output of circulation pumps, as shown in diagrams.

By-Pass line's valve must be kept closed as the boiler is working normally.

By-Pass line's valve can be used in electricity problems and must be opened if there is a risk of overheating in system water caused by an electricity cut or problem.

The pipe used in by-pass line must be at least in the diameter of plumbing systems pipe.

UPS (Power Supply Units) can be used for preventing electricity problems.

Any problems (malfunctions) caused by boiler clogging with dirt from the heating system and/or malfunctions induced by clogging, are not covered by the boiler warranty.

The filter as well as the sludge trap must be checked and cleaned regularly.

Heating water requirements

Heating water requirements are specified in EN Standards. When the sum of concentrations of calcium and magnesium in the water exceeds 1.8 mmol/l, additional non – chemical treatments preventing lime deposition must be considered (e.g. magnetic or electrostatic field treatment).

Boiler location

Angus Max boilers can be located both on non – habitable premises (e.g. in boiler room, cellar, corridor) and in habitable rooms. The room in which the boiler is located must have a permanent supply of air necessary for the combustion process. The air must be free of halogen hydrocarbons and corrosive vapours, and must not be excessively humid and dusty. The room must be protected against frost, with ambient temperature within the range $+5^{\circ}\text{C}$ to $+35^{\circ}\text{C}$ and relative humidity not exceeding 80%.

To comply with fire regulations, the boiler must be installed:

- On floor constructed of non-flammable material.
- On a non – flammable material overlapping the boiler footprint by 20mm on each side and covering the entire depth of the boiler body.
- If the boiler is installed in a cellar, we recommend to put it on a socket at least 50mm high, positioning the boiler in the middle

To comply with standards, at least 600mm manipulation space must be left in front of the boiler. Minimum distance between the back of the boiler and the wall must be also 600mm, and a free space of at least 600mm must be left between one side of the boiler and the wall, to allow access to the rear of the boiler. Fuel must not be stacked directly behind or next to the boiler at a distance less than 800mm. If there are two boilers in the boiler room, no fuel is allowed to be stacked between them. We recommend to keep a minimum distance of 800mm between the boiler and fuel (**Fig. 21**), or keep fuel in a room other than the one in which the boiler is installed.



- Do not put flammable materials on top of the boiler or near the boiler than specified safety distance.

Minimum distances

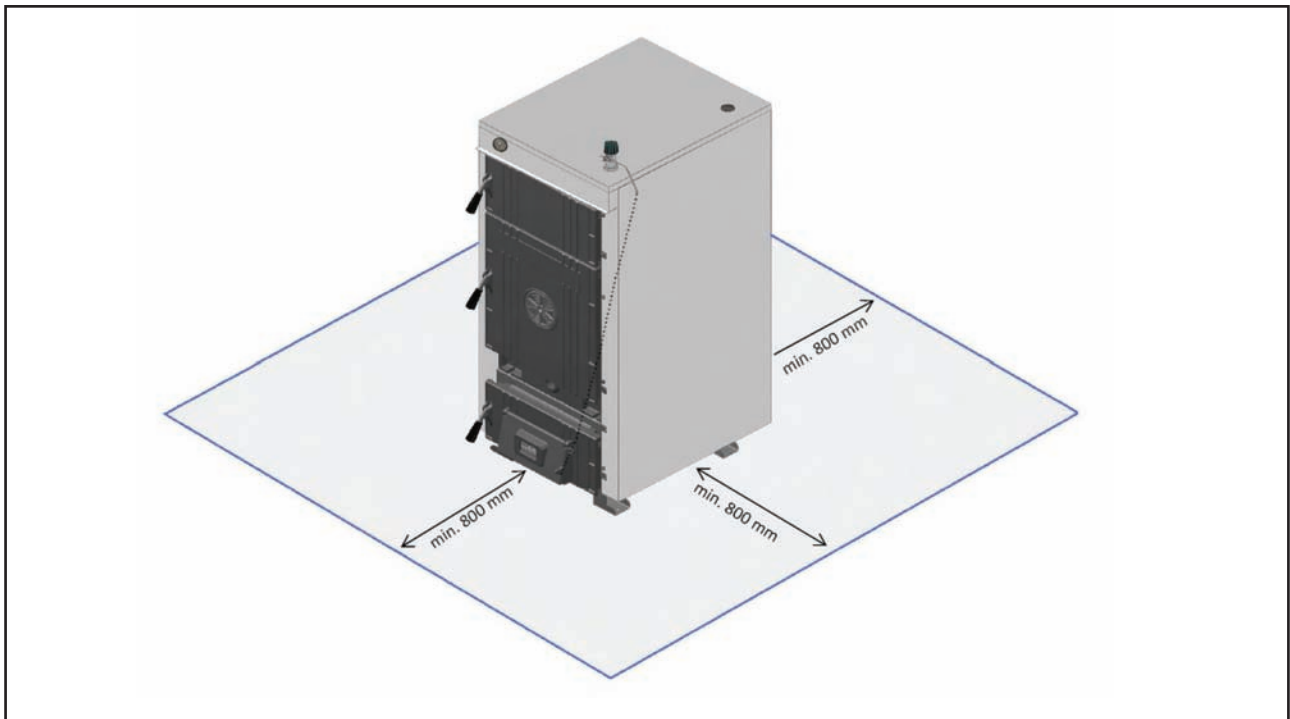


fig. 21

Boiler room disposition layout

Fig. 22 illustrates minimum distances which must be kept in order to ensure safe operation of the boiler room and allow manipulations with the boiler, such as cleaning and stoking. The distance between the front of the boiler and the wall should be at least the boiler length L plus 500mm. Minimum distances between the boiler side and rear should be 800mm, with the distance of the rear also determined by the way the boiler is connected to the chimney.

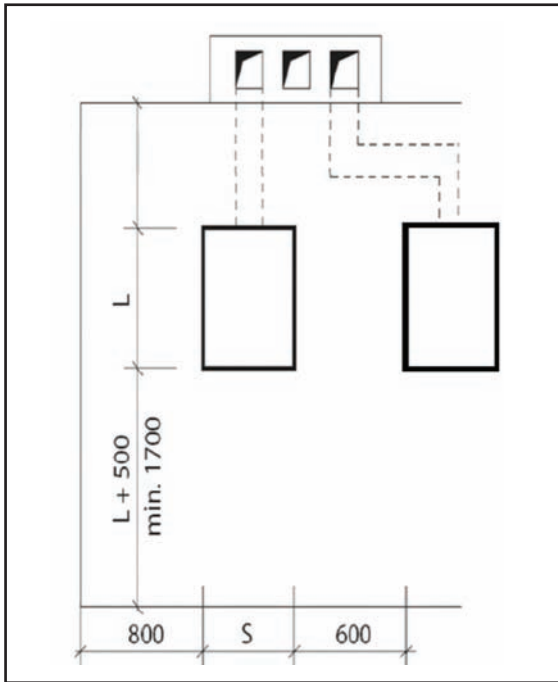


fig. 22



- Do not touch hot water connections or the flue outlet when the boiler is operating.

Installation procedure

- Place the boiler body on a non-flammable materials.
- Install a thermal safety valve.
- After connecting the boiler to the heating system, screw filling and drain stopcocks into the back section.
- Screw the flue adapter with smoke flap onto the boiler combustion gases outlet.
- Put a flue over the flue adapter and insert it into the chimney connection hole. The flue diameter is 150mm.
- Install a thermo-mechanical output regulator into the opening in the top part of the front section.
- We recommend fitting shutting valves on the hot water inlet and outlet, without which it would be necessary to drain the entire heating system before the filter can be cleaned.
- No shutting valve may be installed between the boiler and the expansion vessel.

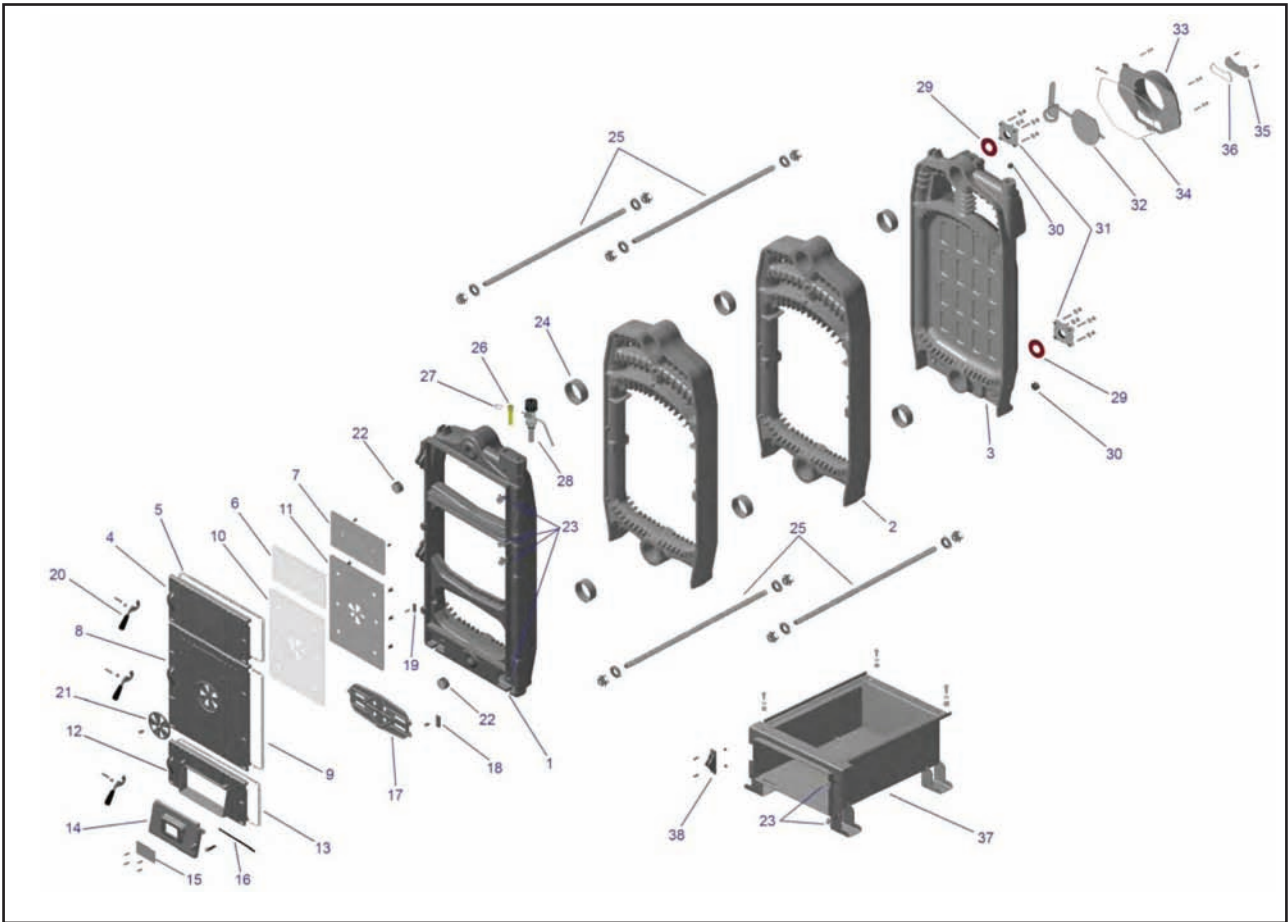


fig. 23

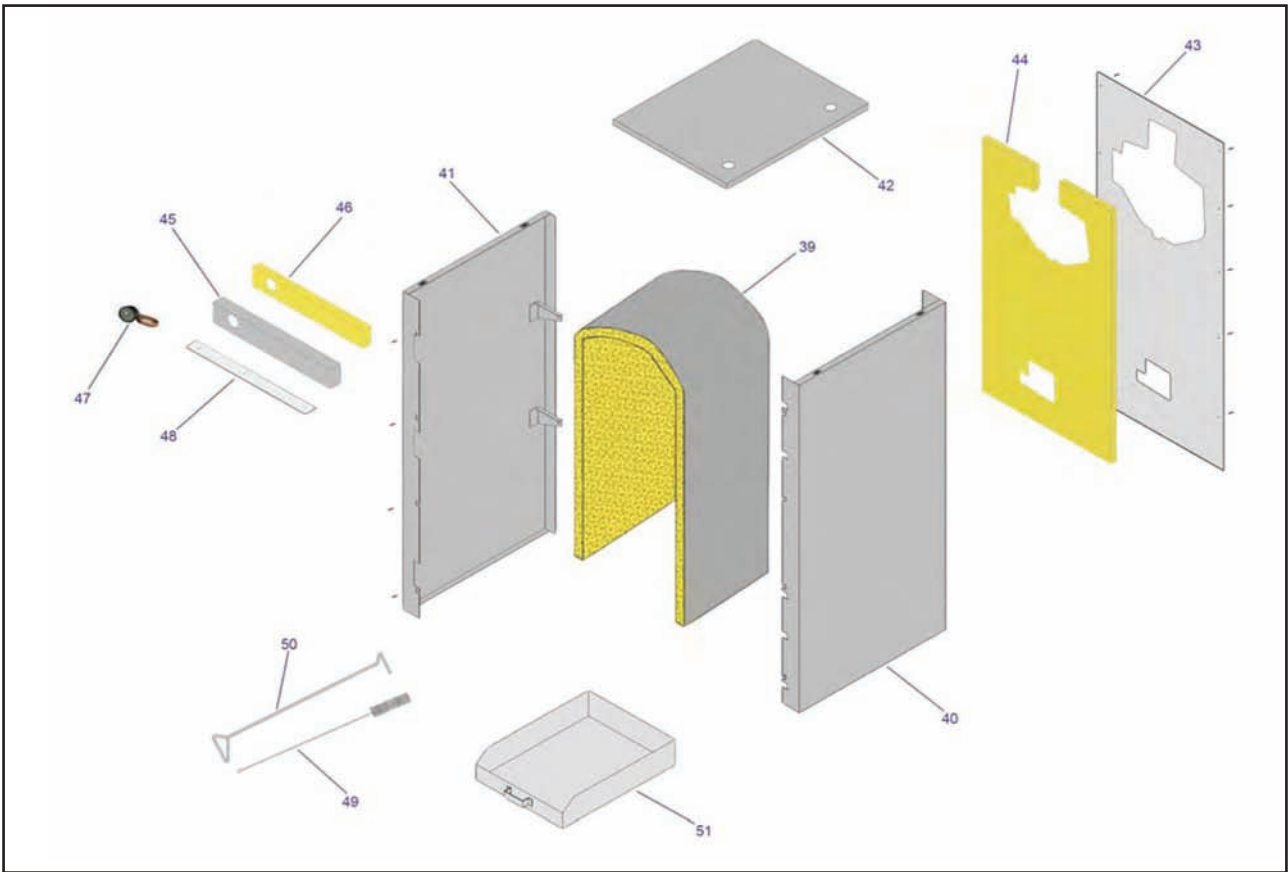


fig. 24

Spare parts list

ITEM	DESCRIPTION	DRAWING NO	PART NUMBER						
			Angus Max-04	Angus Max-05	Angus Max-06	Angus Max-07	Angus Max-08	Angus Max-09	Angus Max-10
1	Front Section	SX 001500111	SX-MD.060	SX-MD.060	SX-MD.060	SX-MD.060	SX-MD.060	SX-MD.060	SX-MD.060
2	Middle Section	SX 001500112	SX-MD.050	SX-MD.050	SX-MD.050	SX-MD.050	SX-MD.050	SX-MD.050	SX-MD.050
3	Back Section	SX 001500113	SX-MD.070	SX-MD.070	SX-MD.070	SX-MD.070	SX-MD.070	SX-MD.070	SX-MD.070
4	Cleaning Door	SX 001500114	SX-PD.010	SX-PD.010	SX-PD.010	SX-PD.010	SX-PD.010	SX-PD.010	SX-PD.010
5	Cleaning Door Isolation Rope	SX 001500115	SX-CY.011	SX-CY.011	SX-CY.011	SX-CY.011	SX-CY.011	SX-CY.011	SX-CY.011
6	Cleaning Door Isolation	SX 001500116	SX-SE.012	SX-SE.012	SX-SE.012	SX-SE.012	SX-SE.012	SX-SE.012	SX-SE.012
7	Cleaning Door Isolation Cover	SX 001500117	SX-PD.013	SX-PD.013	SX-PD.013	SX-PD.013	SX-PD.013	SX-PD.013	SX-PD.013
8	Stoking Door	SX 001500118	SX-BD.014	SX-BD.014	SX-BD.014	SX-BD.014	SX-BD.014	SX-BD.014	SX-BD.014
9	Stoking Door Isolation Rope	SX 001500119	SX-PD.015	SX-PD.015	SX-PD.015	SX-PD.015	SX-PD.015	SX-PD.015	SX-PD.015
10	Stoking Door Isolation	SX 001500120	SX-PD.020	SX-PD.020	SX-PD.020	SX-PD.020	SX-PD.020	SX-PD.020	SX-PD.020
11	Stoking Door Isolation Cover	SX 001500121	SX-CY.021	SX-CY.021	SX-CY.021	SX-CY.021	SX-CY.021	SX-CY.021	SX-CY.021
12	Ashtray Door	SX 001500122	SX-SE.022	SX-SE.022	SX-SE.022	SX-SE.022	SX-SE.022	SX-SE.022	SX-SE.022
13	Ashtray Door isolation Rope	SX 001500123	SX-PD.023	SX-PD.023	SX-PD.023	SX-PD.023	SX-PD.023	SX-PD.023	SX-PD.023
14	Regulation Hatch	SX 001500124	SX-PD.030	SX-PD.030	SX-PD.030	SX-PD.030	SX-PD.030	SX-PD.030	SX-PD.030
15	Regulation Hatch Cover	SX 001500125	SX-PD.024	SX-PD.024	SX-PD.024	SX-PD.024	SX-PD.024	SX-PD.024	SX-PD.024
16	Regulation Hatch Pin	SX 001500126	SX-PD.040	SX-PD.040	SX-PD.040	SX-PD.040	SX-PD.040	SX-PD.040	SX-PD.040
17	Grid	SX 001500127	SX-DT.041	SX-DT.041	SX-DT.041	SX-DT.041	SX-DT.041	SX-DT.041	SX-DT.041
18	Grid Lock Hinge	SX 001500128	SX-GH.041	SX-GH.041	SX-GH.041	SX-GH.041	SX-GH.041	SX-GH.041	SX-GH.041
19	Grid Lock	SX 001500129	SX-GC.041	SX-GC.041	SX-GC.041	SX-GC.041	SX-GC.041	SX-GC.041	SX-GC.041
20	Door Handle	SX 001500130	SX-SD.080	SX-SD.080	SX-SD.080	SX-SD.080	SX-SD.080	SX-SD.080	SX-SD.080
21	Air Rosette	SX 001500131	SX-ST.090	SX-ST.090	SX-ST.090	SX-ST.090	SX-ST.090	SX-ST.090	SX-ST.090
22	Stopper 1/4"	SX 001500132	SX-ST.091	SX-ST.091	SX-ST.091	SX-ST.091	SX-ST.091	SX-ST.091	SX-ST.091
23	Lock Hinge (35)	SX 001500133	SX-SD.085	SX-SD.085	SX-SD.085	SX-SD.085	SX-SD.085	SX-SD.085	SX-SD.085
24	Nipple	SX 001500134	SX-ST.110	SX-ST.110	SX-ST.110	SX-ST.110	SX-ST.110	SX-ST.110	SX-ST.110
25	Connection Rod	SX 001500135	SX-ST.123	SX-ST.124	SX-ST.125	SX-ST.126	SX-ST.127	SX-ST.128	SX-ST.129
26	Thermostat Bulb	SX 001500136	SX-PM.140	SX-PM.140	SX-PM.140	SX-PM.140	SX-PM.140	SX-PM.140	SX-PM.140
27	Thermostat Bulb Segment	SX 001500137	SX-PM.131	SX-PM.131	SX-PM.131	SX-PM.131	SX-PM.131	SX-PM.131	SX-PM.131
28	Thermostatic Regulator	SX 001500138	SX-PD.215	SX-PD.215	SX-PD.215	SX-PD.215	SX-PD.220	SX-PD.220	SX-PD.220
29	Flange Gasket	SX 001500139	SX-KC.300	SX-KC.300	SX-KC.300	SX-KC.300	SX-KC.300	SX-KC.300	SX-KC.300
30	Stopper 1/2"	SX 001500140	SX-PD.400	SX-PD.400	SX-PD.400	SX-PD.400	SX-PD.400	SX-PD.400	SX-PD.400
31	Water Inlet – Outlet Flange	SX 001500141	SX-PD.401	SX-PD.401	SX-PD.401	SX-PD.401	SX-PD.401	SX-PD.401	SX-PD.401
32	Chimney Flap	SX 001500142	SX-PD.402	SX-PD.402	SX-PD.402	SX-PD.402	SX-PD.402	SX-PD.402	SX-PD.402
33	Chimney	SX 001500143	SX-PD.403	SX-PD.403	SX-PD.413	SX-PD.413	SX-PD.413	SX-PD.423	SX-PD.423
34	Chimney Isolation Rope	SX 001500144	SX-PD.404	SX-PD.404	SX-PD.404	SX-PD.404	SX-PD.404	SX-PD.404	SX-PD.404
35	Chimney Cleaning Door	SX 001500145	SX-PD.405	SX-PD.405	SX-PD.405	SX-PD.405	SX-PD.405	SX-PD.405	SX-PD.405
36	Chimney Cleaning Door Isolation Rope	SX 001500146	SX-PD.450	SX-PD.450	SX-PD.450	SX-PD.450	SX-PD.450	SX-PD.450	SX-PD.450
37	Ash Tank	SX 001500147	SX-TD.451	SX-TD.452	SX-TD.453	SX-TD.454	SX-TD.455	SX-TD.456	SX-TD.457
38	Door Lock Socket	SX 001500148	SX-PD.061	SX-PD.061	SX-PD.061	SX-PD.061	SX-PD.061	SX-PD.061	SX-PD.061
39	Casting Body Insulation	SX 001500149	SX-ST.141	SX-ST.142	SX-ST.143	SX-ST.144	SX-ST.145	SX-ST.146	SX-ST.147
40	Right Side Cover Panel	SX 001500150	SX-ST.603	SX-ST.604	SX-ST.605	SX-ST.606	SX-ST.607	SX-ST.608	SX-ST.609
41	Left Side Cover Panel	SX 001500151	SX-ST.653	SX-ST.654	SX-ST.655	SX-ST.656	SX-ST.657	SX-ST.658	SX-ST.659
42	Top Cover Panel	SX 001500152	SX-ST.703	SX-ST.704	SX-ST.705	SX-ST.706	SX-ST.707	SX-ST.708	SX-ST.709
43	Rear Cover Panel	SX 001500153	SX-ST.900	SX-CY.900	SX-CY.900	SX-CY.900	SX-CY.900	SX-ST.900	SX-CY.900
44	Rear Cover Panel Isolation	SX 001500154	SX-CY.901	SX-CY.901	SX-CY.901	SX-CY.901	SX-CY.901	SX-CY.901	SX-CY.901
45	Front Cover Panel	SX 001500155	SX-ST.753	SX-ST.753	SX-ST.753	SX-ST.753	SX-ST.753	SX-ST.753	SX-ST.753
46	front Cover Panel Isolation	SX 001500156	SX-CY.763	SX-CY.763	SX-CY.763	SX-CY.763	SX-CY.763	SX-CY.763	SX-CY.763
47	Thermometer	SX 001500157	SX-IM.160	SX-IM.160	SX-IM.160	SX-IM.160	SX-IM.160	SX-IM.160	SX-IM.160
48	Protection Steel Sheet	SX 001500158	SX-ST.773	SX-ST.773	SX-ST.773	SX-ST.773	SX-ST.773	SX-ST.773	SX-ST.773
49	Cleaning Brush	SX 001500159	SX-ST.803	SX-ST.804	SX-ST.805	SX-ST.806	SX-ST.807	SX-ST.808	SX-ST.809
50	Mixing Rod	SX 001500160	SX-ST.903	SX-ST.904	SX-ST.905	SX-ST.906	SX-ST.907	SX-ST.908	SX-ST.909
51	Ashtray	SX 001500161	SX-YT.773	SX-YT.774	SX-YT.775	SX-YT.776	SX-YT.777	SX-YT.778	SX-YT.779

fig. 25

Accumulator tank capacity

NOTE: The heat can be supplied for example by an accumulator tank. The following applies as a reference for the minimum storage boiler content:

$$V_{sp} = 15T_b \times Q_N (1 - 0,3 \times (Q_H/Q_{min}))$$

V_{sp} : Accumulator tank capacity in L

Q_N : Nominal heat output in kW

T_b : Burning period in h

Q_H : Heating load of the premises in kW

Q_{min} : Minimum heat output in kW

Heating boilers using several allowable fuels should have the tank size based on the fuel which requires the largest accumulator tank. The accumulator tank is not necessary when the required volume is less than 300L.

Transportation and storage

The manufacturer handles the boiler that is on a pallet and secured against shifting (with screws). The boiler may not be transported in a different position than on its base.

At least regular storage conditions shall be ensured during boiler storage and transportation (non-aggressive environment, air humidity lower than 75%, temperature range from 5°C to 55°C, low dustiness and preventing influence of biological factors).

The force may not be applied on the boiler coverings and panel during storage and transportation.



- Boiler must not be carried or transported without using forklifts, pallets or other wheeled carrying vehicles.

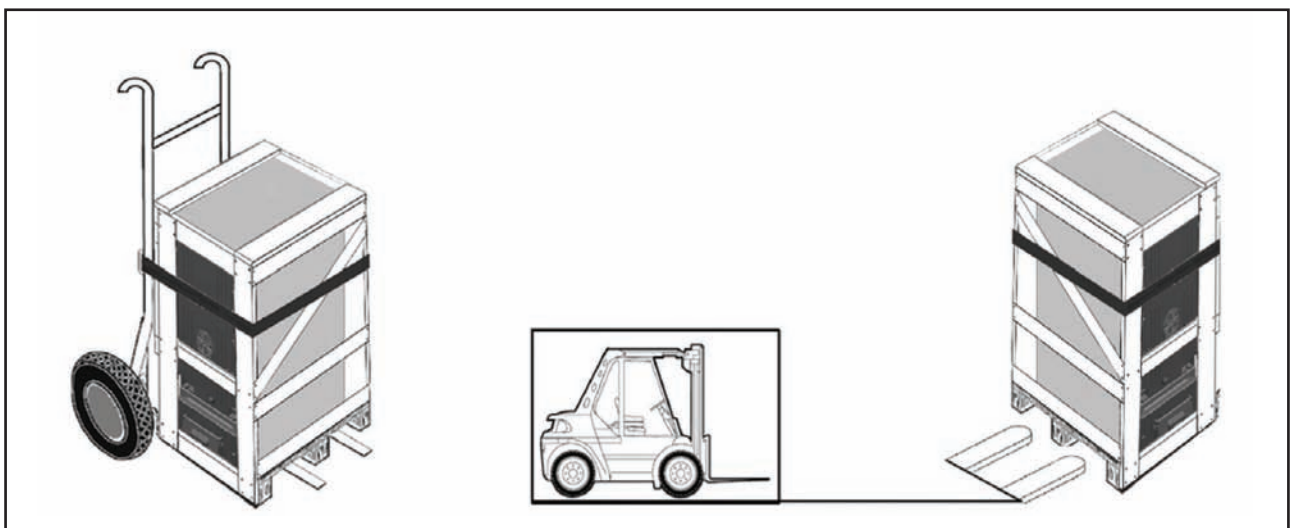


fig. 26

Flue pipe Installation

Fig. 27 shows the proper flue gas connection with additional air equipment. Observe the following during the installation of the flue gas connection:

- Install a flue pipe connection with an inspection aperture for cleaning.
- Fasten the flue gas connector piece to the boiler.
- Feed the connector into the flue gas system on a short, ascending path. Avoid deflections, especially those with an angle of 90°.
- Fasten and support connectors sufficiently.
- Since the flue pipe is only fixed into the flue gas system and push-fitted onto the boiler flue socket, it should be fitted very carefully so that it does not come loose.
- Only use parts of non-flammable materials for the flue gas system.

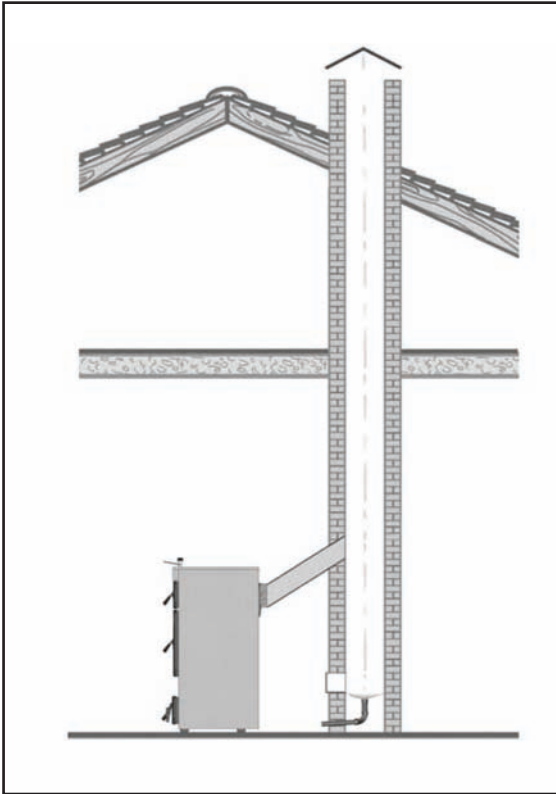


fig. 27

Chimneys and chimney connection warnings

A sufficient flue draft of the flue gas system is the basic requirement for the correct functioning of the boiler.

It fundamentally affects its performance and efficiency. Therefore, heed the following for the flue gas connection:

- Please note that the boiler must be connected to the flue gas system in accordance with the latest recommendations from Hetas.
- Building code regulations, manufacturer's instructions and in consultation with an approved flue installer.
- The boiler may only be connected to a flue gas system with proper flue draft (technical spec. table).
- The dimension calculations of the flue gas path must be based on the flue gas mass-flow rate at maximum rated output.
- The effective chimney flue height is measured from the point of entry of the flue pipe into the chimney.
- Ensure that the calculation of the flue gas path and the connection of the flue gas system is only carried out by qualified personnel.
- If a wrong boiler chimney is connected, the warranty is not valid.

The figures below are only guide figures. The draft depends on the diameter, height, roughness of the chimney wall, and the temperature difference between combustion products and the outside atmosphere. We recommend the use of a chimney liner.

Have precise calculations carried out by a heating engineer or flue installer.

$$F = \frac{a \cdot Q_N}{\sqrt{H}}$$

Coefficient = 0,041 (for wood)

Coefficient = 0,027 (for carbon)

F = Section Resulting (cm²)

a = Coefficient

Q_N = Boiler Heat Output (kCal/h)

H = Height of Chimney (meters)

Troubleshooting

Problem	Reason	Solution
Boiler is not heating	Quality of the fuel might be low and/or the moisture content of the fuel maybe high	Try to use fuel which has better calorific value and moisture
	Operational instructions are not fulfilled	Inspect chimney draft, position of flap, circulation of outlet temperature
	Tar existing on surface of heat exchanger	Regularly clean the heat exchanger with the brush supplied by Eco Angus Ltd
Over condensation on boiler part and formation of black liquid	Using fuel which has high moisture	Use proper fuel
	Low outlet temperature	Try to operate the boiler with a chimney temperature 160K above ambient temperature
Outlet temperature of boiler is not adjusted	Lower door is not sealed properly when closed	Check the sealing of the lower door or replace it with a new one
	Temperature controller (draft regulator) is not functional	Check functionality of the device
Boiler is heating but radiators are not	Circulation pump is not working or water circulation was blocked (i.e. closed valve)	Check circulation system, especially the water pump



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